NAC
ARCHITECTURE

Architectural Design Narrative

Petersburg Medical Center

December 1, 2019

Introduction

In order to order to inform the budgeting process it is necessary to define some basic assumptions regarding the structure, building envelope materials and interior finishes. These assumptions are based on appropriate strategies for the typical weather and site conditions in Southeast Alaska. It should be noted however that these are not design decisions at this point. They are simply a base line placeholder to assure that sufficient allowances are built into the budget to afford design flexibility as the project moves forward with greater definition.

Site and Building Organization

The two sites will significantly influence the building organization, and this is reflected in the site diagrams for each. The limited space available at the downtown location forces a multi-story approach with the structural engineering and seismic restraint required to support that solution. However the site is largely developed with good utility services so site preparation scope is minimized. The nature of the location will also limit the amount of onsite paving and landscaping required.

At the Haugen Drive site there is enough space to allow for a single story solution which will tend to mitigate structural and seismic costs. Utilities are available at the adjacent Haugen drive and side streets allowing convenient extension of water and sewer services to the facility. However the site is otherwise undeveloped, requiring more extensive site preparation and improvement including excavation of unsuitable materials and placement of structural fill to provide a solid building pad, and extensive paving for access roads and parking.

Project Approach

As a general guide the facility will be planned as a 50-year building. At either site the approach to building envelope will incorporate robust rain management at the roofs, durable materials that can withstand the marine environment with minimal maintenance, and thermal performance to meet or exceed energy code requirements. To provide a healing environment windows, clerestories and skylights will be incorporated to maximize daylight harvesting and provide inspiring views out to the natural surroundings. Subtle landscaping using native species will be incorporated at select outdoor settings accessible from the proposed café and long term care unit.

Exterior Closure

The predominant exterior cladding material will potentially be prefinished metal panels or cement shingles with some masonry or stone veneer features. The cladding will be attached with metal furring

channels over an air space cavity. The building side of the airspace cavity will have continuous rigid polyisocyanurate insulation 1.5 inches thick over a rain screen membrane and exterior fiberglass-mat gypsum sheathing attached to metal stud wall framing. The interior side of the metal stud wall framing system will have spray applied foam insulation with painted gypsum wallboard at the exposed interior face. Exterior metal panels will be complemented with stone veneer at selected locations near entries and ground planes to provide a more natural, tactile visual character.

Roofing will be primarily sloped standing seam metal roofing over a water and ice barrier on minimum R-30 rigid insulation adhered to moisture resistant sheathing. Soffits at roof overhangs will be integrally colored cement fiber board panels. Any low slope roof areas will be an exposed membrane with a continuous vapor barrier adhered to structural deck. Minimum R-30 rigid insulation boards will be adhered to the vapor barrier, with ¼" cover board adhered to rigid insulation and single ply membrane adhered to cover board. Walk pads installed where required at roof access paths and mechanical equipment service areas.

Aluminum Curtain Wall, Storefront, Windows and Doors

The main entrance lobby will utilize a prefinished aluminum curtain wall window framing system with insulated glazing wherever it extends more than a single story in height. Prefinished aluminum storefront window framing with insulated glazing will be incorporated in openings less than 10' tall at corridors along exterior walls and at openings facing outdoor activity areas. Prefinished aluminum windows with insulated glazing will be used at all other punched window openings.

Entrance systems will be tailored to the hospital programmatic needs. Swing doors will be heavy duty type to support automatic opener hardware. All door glazing will be insulated, laminated safety glass. Exterior utility doors will be galvanized metal with an insulated core and a powder coat painted finish.

Interior Construction

Structural steel framing beams and columns will have spray-applied fireproofing throughout. Code required fire and smoke stopping materials will be installed at all rated wall and floor assemblies. Where exposed heavy timber structure is used wood will be sealed and connectors will be painted.

Partitions
Typical interior partitions will be framed with metal studs full height to underside of structure, acoustical insulation and sheathed with abuse resistant (mold resistant) gypsum board with level 4 finish at painted exposed surfaces, level 3 finish where wall coverings are applied. Selected offices, clinic areas and rooms with gypsum board ceilings will have partitions with gypsum board that extends 6" above finished ceilings.

Doors and Openings
Typical interior doors will be solid core wood with plastic laminate finish. Frames will be painted hollow metal, except stainless steel at elevator entrance frames and selected surgery department openings. Finish hardware will be heavy duty mortise type with lever ADA handles. Hardware brand and keyway systems will comply with PMC standards.

Interior Finishes

Wall finishes in staff and patient care areas will have fiberglass reinforced laminate (FRL) wall protection wainscots and stainless steel corner guards. Selected areas will have wall protection bumpers for equipment and mobile cart protection.

Floor finishes in waiting areas, conference rooms and offices will be carpet. Corridors will be sheet vinyl or vinyl composition tile (VCT) where heavy rolling equipment loads are anticipated. Cleanable walkoff mats will be located at all entries.

Window treatment at offices and exam rooms will be standard horizontal blinds.

Ceilings will be washable acoustical lay-in tile with suspended metal T-bar grid throughout.
Selected exam and treatment rooms will have painted gypsum board ceilings. Toilet rooms will have painted gypsum board ceilings. Selected waiting and reception areas will have feature ceilings with wood laminated panels and fabric-wrapped acoustical wall panels with wood trim accents between panels.

Admitting offices will have fabric wrapped acoustical wall panels on one wall with wood trim accents between panels.

Surgery
Operating room will have aseptic resinous epoxy flooring and integral coved base, painted gypsum board ceilings, solid surface wall protection wainscot full height to ceiling with welded seams.

Clinics
Clinical exam and treatment rooms will have sheet vinyl flooring, washable acoustical lay-in tile ceilings with suspended metal T-bar grid. Casework at patient and exam areas will be standard plastic laminate with solid surface countertops and backsplashes.

Imaging
X-ray and fluoroscopy rooms will have lead lined gypsum walls with painted finish. All rooms will have sheet vinyl flooring typically and acoustical lay tile with suspended metal t bar grid ceilings. Dressing areas will have carpet flooring.

Public Areas
Lobby and reception areas will have stone tile and carpet floors. Public lobby and reception areas walls will have laminated wood panels and wall coverings. Waiting and reception areas will have feature ceilings with wood laminated panels, fabric wrapped acoustical wall panels with wood trim accents between panels.
Propane fuel fireplace in main entrance lobby will have cultured stone veneer.

Service Areas
Service areas will have sealed concrete floors.

Conveying Systems (at multi-floor schemes)
Passenger and service elevators will be MRL 350 FPM, 3500 lb. capacity. Passenger cab finishes –plastic laminate wall panels, stainless steel wainscot and sheet vinyl flooring. Service elevator cab finishes – stainless steel, wall protection, VCT flooring.

N:\121-19016\08_Deliverables_Final\Architectural Narrative.docx

TECHNICAL MEMO

Date: January 24, 2020

To: Dan Jardine, NAC Architecture

From: Martin Chase, PE

Subject: Petersburg Medical Center Master Plan
Civil Engineering Narrative

INTRODUCTION

The following narrative is largely a compilation of information gathered from documents provided by others. These documents include:

- Google Maps
- Utility Map and utility/soils information provided by Petersburg Utility Director Karl Hagerman
- Predesign Schemes by NAC
- 2018 Petersburg Development Code

DEMOLITION AND EARTHWORK

The downtown site obviously has many structures and surface improvements requiring demolition, whereas, the Greenfield site will require logging, clearing and grubbing efforts.

Muskeg organic material present at either site would need to be removed and replaced with structural fill where building, road and parking footprints are proposed. How much muskeg needs to be removed has not been determined at the time of this memo as no geotechnical investigations have been performed. The existing hospital is currently on piles, so there is likely muskeg present at the downtown site, which could be anywhere between 0-feet to 5-feet deep. The recent construction of the fire station at Haugen Drive and N. 12th Street required removal of Muskeg between 6.5-feet and 9-feet deep. As this is our best data for the Greenfield site, we recommend accounting for 9-feet of Muskeg removal and structural fill import as the Greenfield site may actually have a deeper Muskeg profile.

It will be important to minimize draining of the muskeg to remain surrounding the sites as well as the adjacent properties as this would cause unintended settlement. A strategy to minimize settlement, therefore, this would be to remove only the amount of muskeg that can be replaced by structural fill in one day. This would add costs over excavating the entire site before replacing with structural fill, however. Once the structural fill is placed, the groundwater should act in a steady state. Foundation drains, if implemented, should be as high as possible.

Stone columns, if local expertise is available, could be an alternative to replacing muskeg or conventional piles. A geotechnical engineer would need to confirm this assumption.

Utilities constructed within the muskeg layer have the potential to settle. To mitigate this cost, utilities should be routed as much as possible near building footprints or within vehicle traveled

areas where muskeg is to be removed anyway. Instances where this is not feasible, the utility trenches would need to be backfilled with native material or geofoam that is similar in weight to the material removed in order to minimize settlement potential. Utilities may also need locking or flexible connections at pipe joints to be able to move with the ground if settlement does occur. Flexible or telescoping connections between muskeg and structural fill sections will be required due to differential settlement.

Utility trenches, if backfilled with material other than native material, should have bentonite check dams every 50-feet to avoid becoming a conduit for draining the surrounding muskegr.

The structural fill would be locally available material conforming to ADOT Standard Specifications. The Borough has its own quarry pit that is used for public projects.

SITE ACCESS/STREET IMPROVEMENTS

Downtown Site:

Borough Development Standards would require new curb, gutter and sidewalk be installed around the full development blocks. Additionally, we would also recommend half street improvements on all street frontages given that existing streets are unpaved and those that are may not survive construction of the medical center. The half street improvements would include new full depth street pavement section and new stormwater infrastructure, see Storm Drainage section below.

Greenfield Site:

Proposed on-site access drives and parking are shown on the NAC concept plan, Scheme 7. These drives would need to be designed with heavy pavement sections to accommodate the weight of emergency, delivery and garbage trucks.

Off-site improvements would require new curb, gutter and sidewalk along the Haugen Drive frontage and perhaps as far as N. 8th Street to comply with the Petersburg Development Code requirement of a Continuous Walkway System. Off-site improvements would also include constructing N. 9th Street and extending Fram Street to serve the proposed ambulance and loading areas. New streets shall be constructed per Commercial Street Standards outlined in Table 3.6.020.C of the Borough Development Code.

STORM DRAINAGE

In general, Petersburg does not provide stormwater infrastructure rather relying on overland surface flow. Stormwater detention or water quality systems are generally not required.

Downtown Site:

The downtown site has an existing 18-inch CMP in Fram Street starting at Second Street and running west. Providing roof and site drainage conveyance to this pipe is preferable to discharging to the street curb and gutter system unless new stormwater infrastructure is provided as part of new street infrastructure with the medical center development.

Greenfield Site:

The Greenfield site generally slopes from the north end of the site towards the south. Haugen Drive is built up on a prism adjacent to the site so access drives would need to be filled adjacent to Haugen with culverts to allow stormwater runoff to migrate. The site will require rainwater pipes and area drains to convey to surface swales that convey stormwater towards Haugen Drive. Since there is no stormwater infrastructure in Haugen Drive, the swale areas should be maximized on site to allow natural drainage infiltration and/or absorption to occur. Maintaining as much of the depressed areas adjacent to Haugen drive would be ideal. Planter and swale soils should contain at least 18-inches of organic bioretention soil to maximize on-site infiltration. Stormwater detention may be required if during design and permitting, it is determined that the stormwater runoff would have adverse impacts downstream of the site.

SANITARY SEWER

There is one wastewater treatment plant serving Petersburg with pumps and distributive piping delivering wastewater to the plant where it is treated to NPDES standards and discharged to Frederick Sound.

Downtown Site:

The existing hospital is served by a side sewer connected to an 8-inch PVC sewer main in First Street that drains towards the existing 8-inch PVC sewer main in Fram Street, which drains west. There are also 8-inch PVC sewer mains in Excel Street, Second Street and Third Street adjacent to the site.

The sewer infrastructure appears adequate to serve the proposed medical center development except that the existing sewer main in Second Street, if conveying wastewater beyond the site, would need to be relocated as it will be demolished as part of the proposed street vacation. Otherwise no new sanitary sewer infrastructure is required except for new side sewers for the proposed hospital and medical office building.

Greenfield Site:

There is an existing 8-inch PVC sanitary sewer main in Haugen Drive on the opposite side of the road from the Greenfield site. There is also an 8-inch asbestos cement (AC) pipe sewer main in Fram Street and a sewer main in Excel Street of unknown size and material type.

Since the site slopes towards Haugen Drive and the sewer main in Haugen Drive is PVC (newer than AC), we recommend that the medical center sanitary side sewers be routed to the sewer main in Haugen Drive. This will require a new side sewer crossing the entire width of Haugen Drive.

POTABLE WATER

The source of Petersburg water is from two reservoirs Cabin Creek (primary) and City Creek (back-up), which provide a reliable source of potable water. According to the Petersburg's 2018 Annual Water Quality Report, water quality within the potable water system meets both state and federal standards.

Downtown Site:

Existing water main infrastructure surrounds the downtown site:

- 8-inch ductile iron pipe (DI) in First Street
- 8-inch high density polyethylene pipe (HDPE) in Second Street
- 4-inch asbestos cement pipe (AC) in Third Street
- 10-inch DI in Fram Street from First to Second Street
- 10-inch AC in Fram Street from Second to Third Street
- 10-inch DIP in Excel Street

Existing fire hydrants are present at all the adjacent intersections except for 2nd and Fram.

Three separate fire hydrant flow tests conducted in 2016 in Nordic Drive, one block west of the site, resulted in flow rates ranging from approximately 3,800 GPM to 4,800 GPM at a residual pressure of 20 PSI, and static pressures around 100 PSI, which are robust.

The existing water infrastructure appears to be adequate to serve the domestic and fire suppression needs of the proposed medical center development at this site except that with the vacation of Second Street, the existing 8-inch HDPE water main will be removed from the water grid. We would expect Public Works to require a new 8-inch water main to be installed in Third Street and remove the old 4-inch AC water main. The 10-inch AC water main in Fram may need to be replaced with DI pipe if construction impacts require replacing. AC pipe is typically old and brittle and would be prudent to replace at the time of construction of the hospital phase.

The development will require new domestic and fire services. The domestic line will include a new meter and the fire service will need a backflow preventer which would most likely be in the fire sprinkler riser room and a fire department connection for each building in separate phases. The FDC may be wall mounted on the building if the local fire chief allows it.

Greenfield Site

Existing water main infrastructure is available on the south and west sides of the site and partially on the north side:

- 14-inch DI in Haugen Drive
- 10-inch DI in the unimproved but platted N. 9th Street
- 10-inch DI in Fram Street extending approximately 240-feet east of N. 9th Street

Nearby existing fire hydrants are in N. 8th Street at Haugen Drive and at Excel Street as well as at the Mountain View Manor apartments.

A fire hydrant flow test was conducted in 2013 resulting in a flow of 2300 GMP at a residual pressure of 20 PSI. We recommend that is fire hydrant be tested to verify current flow and pressure.

The existing water infrastructure appears adequate to serve the domestic and fire suppression needs of the proposed medical center development at this site except that Public Works may require a new water main be installed to provide a loop around the medical center for redundancy. This loop could be to extend the 10-inch water main in Fram Street east then

southeast to connect to the existing water main in 12th Street. For planning purposes, assume three new fire hydrants will be required. The medical center will also require new domestic service and meter and a new fire suppression service with backflow preventer in the fire sprinkler riser room, most likely off of the existing 10-inch main in either unimproved N. 9th Street or Fram Street. A fire department connection standpipe will need to be installed as well but may be wall mounted if allowed by the fire marshall.

NATURAL GAS

Natural gas infrastructure is not available in Petersburg. Properties using gas are supplied by propane trucks to individual onsite tanks.

POWER AND COMMUNICATIONS

See Electrical Engineering Narrative

TECHNICAL MEMO

Date: December 17, 2019

To: Dan Jardine, NAC Architecture

From: David Arndt, PE

Subject: Petersburg Medical Center Master Plan
Structural Engineering Narrative

GENERAL

The anticipated potential structural systems for the proposed schemes are applicable to all the schemes. They consist of gravity framing systems of structural steel, mild-reinforced concrete, or heavy timber, or some combination thereof. It's expected that a concrete-framed structure would be more expensive than a steel-framed or timber structure, due to 1) the need to transport much of the material for the concrete to Petersburg for this size of building and 2) the associated labor force requirements. In addition, a steel-framed structure is more easily modified for future changes, such as the addition of hung medical equipment, than a concrete or timber structure and can generally be constructed more quickly than a concrete-framed structure.

STEEL FRAMING

For a steel-framed building, the likely gravity floor framing system for elevated floors would be concrete on steel deck slabs supported by steel wide flange beams and columns. The columns would preferably be spaced not more than about 30 feet on center in both directions to avoid more expensive or deeper framing to meet the desired vibration performance. The likely gravity roof framing system would be steel deck supported by steel wide flange beams and columns. However, if a steel roof deck would need to be fireproofed, a concrete slab on metal deck roof without fireproofing may be preferable.

LATERAL BRACING

Potential candidates for the lateral framing system for a steel-framed building include steel moment frames and steel braced frames. Steel moment frames are generally more expensive than steel braced frames, but the moment frames provide for greater flexibility for future modifications by not creating "hard" wall locations.

FOUNDATION

The columns would most likely be supported by concrete spread footings, with concrete slabs on grade. Due to the typical soil conditions in Petersburg with a layer of muskeg overlaying suitable bearing material, it is likely that muskeg would need to be removed and replaced with structural fill to accommodate spread footings. Pile foundations with concrete grade beams are another foundation option, in order to avoid the need for removal of muskeg under the building footprint but using a deep foundation system of this type is expected to be a more expensive approach. In general, Petersburg does not provide stormwater infrastructure rather relying on overland surface flow. Stormwater detention or water quality systems are generally not required.

MEMO

SINGLE VS. MULTI-STORY

Due to the likely need to remove and replace the layer of muskeg, building schemes with smaller footprints may be determined to have lower total costs. However, the reduction in cost for a smaller footprint building scheme may be offset by the cost of some structured floors in multi-story areas of the building.

COFFMAN ENGINEERS

Mechanical System Design Narrative

Petersburg Medical Center

Fire Sprinkler System

Summary

The facility will be fully fire-sprinklered with a conventional wet-pipe system. Dry sprinkler heads served from the wet system or a separate dry-pipe system will be included as needed to protect areas subject to freezing. Conventional steel piping and semi-recessed quick-response sprinkler heads anticipated in most areas. The water utility will be the primary water supply with conventional pumper connections for additional water supply. Depending on utility water pressure and reliability at the selected site, an electric fire pump and/or on-site water storage may be needed.

Plumbing System

Summary

The facility will have a conventional "hospital-grade" plumbing system. The following attributes are anticipated:

- Copper domestic water piping. Cast iron sanitary and roof drainage piping.
- Institutional-grade vitreous china plumbing fixtures. Wall hung water closets as default except floor-mount will be considered for bariatric reasons in certain areas. Field-repairability and durability will be important for faucets and flush valves.
- Dual, fuel-fired domestic water heaters will provide 140-degree hot water for kitchen and CS areas and to central thermostatic mixing valves that will temper water circulated to patient areas to 118 degrees. Hot water piping systems will be circulated with extra provisions to minimize dead-legs and provide rapid hot water response to fixtures.
- Water softening and other methods of treatment will be provided as appropriate for local water quality.
- Conventional hospital-grade medical gas systems will be included, design to NFPA standards and plumbing code requirements. Oil-free "claw" type vacuum pumps anticipated. Oil-free reciprocating medical air compressors with full air quality conditioning/monitoring anticipated. Indoor manifolds for piped gasses anticipated.
- Fuel piping systems and tanks will be provided to serve boilers, water heaters and emergency generators.
- Propane tank and piping will be provided to serve fireplaces.

Heating, Ventilating and Air Conditioning (HVAC) System

Considerations

HVAC systems in medical facilities must perform multiple functions simultaneously and reliably, giving rise to a demanding array of expectations, including:

E1 Ventilation (air-change) rates must meet standards in most healthcare areas.

E2 Heating and cooling must meet strict temperature standards with individual control in many areas.
E3 High efficiency air filtration must be used to avoid circulation of harmful contaminants by the system.
E4 Certain rooms must be pressurized to minimize migration of contaminants to/from adjacent rooms.
E5 Systems must continue partial (essential) service when normal sources of energy are not available.
E6 Systems must be rugged enough to continue partial operation after component failure or earthquake.
E7 Systems should perform above standards to improve comfort and further minimize odors.
E8 Systems should be long-lived and economical to maintain to minimize operating/replacement costs.
E9 Systems should be energy efficient to minimize operating cost and environmental impact.
E10 Systems should be economical to construct.

The ultimate selection of a system and its associated equipment can be complicated as some options meet certain expectations very well but underperform on others. Any system considered needs to meet the "must-haves," specifically expectations E1-E6. This narrows the choices down to very few options and means decisions must be based on weighting of E7-E10.

Expectation E8 (long-lived and economical to maintain) is very dependent on local conditions. Coastal locations can be very hard on exterior equipment, for example, reducing longevity. Complicated packaged equipment, requiring out-of-town specialists for maintenance and repair, can be a difficult choice for remote locations like Petersburg even though complicated equipment often performs well with E9 and E10.

The following four HVAC system options have been identified as good contenders for the new Petersburg Medical Center considering the size of the facility, the semi-remote location, the climate, and the fact that it is new construction and not needing to mesh into an existing (sub-standard) facility. With each of these options, operable windows in patient rooms are optional with (if desired) wired switches to deactivate heating/cooling in that room whenever a window is opened.

Option A – Variable Air Volume (VAV) with Hydronic Heating and Air-cooled Central Chillers
Central air handlers with associated return and exhaust fans located in mechanical rooms that each provide air to large portions of the building. Energy recovery will transfer heat from exhaust air to incoming fresh air. Hydronic heating water loop with fuel-fired (and possible electric) boilers supplying up to 180-degree water to convection/radiant heaters in patient rooms (acute and LTC) and to reheat coils at VAV terminal units (conventional and fan-powered) serving areas where heaters are not desired. Chilled water (glycol) system providing cooling to air handlers with outdoor, air-cooled chillers having multiple sections so failure of one section will not prevent continued operation with reduced capacity.

> **E7 Benefits:** Convection/radiant heating in patient rooms can feel more comfortable as heating is provided without significant air movement near floor level.

E8 Benefits: Most equipment is located inside the building, away from coastal environment and weather, and of a type that is generally long-lived (only the cooling equipment needs to be located outside.) Air handlers are few, simple and durable with field-replaceable parts. Boilers and pumps are well understood by regional service providers. Virtually all equipment is located away from patient care areas, simplifying maintenance. It may be beneficial to include an electric resistance boiler in the heating plant, which could reduce energy cost depending on the prevailing cost of heating oil.
E9 Benefits: Average energy efficiency. This system is generally not energy efficient since air delivered to many spaces must be reheated with boiler energy after being (unnecessarily) cooled. Long duct runs require more motor energy for fans. To minimize inefficiency, the use of exhaust air heat recovery will reduce heating energy, "economizer" cooling (increasing the percentage of outdoor air) will reduce chiller energy. Also, the use of radiant/convective heating in patient rooms can further reduce heating and cooling energy by minimizing the amount of air supply (that would need reheating) to patient rooms when cooling is not needed.
E10 Benefits: This system is not inexpensive mechanically due to the higher cost of the hydronic heating system, the central chiller system, exhaust heat recovery and the cost of long runs of larger ductwork. Some offsetting cost advantages of this option include the ability to locate cooling equipment at grade, remotely from air handlers, providing architectural (visual) benefits and reducing general construction costs to accommodate noise, structural support and visual screening issues associated with what otherwise usually becomes multiple smaller AC units across the roof.

Option B – Variable Air Volume (VAV) with Hydronic Heating and DX Cooling
Same as Option A except use roof-mounted split system direct-expansion (DX) cooling units for each handler instead of the central chiller plant.

E7 Benefits: Same as Option A
E8 Benefits: Same as Option A. Multiple DX cooling units will require about the same amount of maintenance as fewer chillers with a separate hydronic piping system.
E9 Benefits: Same as Option A
E10 Benefits: Similar to Option A except DX cooling will cost less than a central chiller plant. As noted, above, additional general construction cost may be needed to accommodate multiple roof-mounted DX units.

Option C –Fan Coil System with DOAS Units and Hydronic Heating/Cooling
Roof-mounted, packaged dedicated outside air systems (DOAS) supply ventilation air (outside and exhaust air) to large portions of the building. Outside air from the DOAS system is injected into fan coil units located in patient rooms and most other spaces. The fan coil units do most of the air conditioning (heating and cooling) with recirculating room air. Filtered return air grilles can be used where its important to limit necessity to access the ceiling for filter maintenance. Ventilation air is generally a small percentage of the total air supply needed for heating and cooling, so distribution ductwork across the building is much smaller than ductwork associated with the options above.

The hydronic water loop with boilers only need to supply up to 115-degree water to fan coil units and terminal units when the system is in heating mode since multi-row coils are used. A split-system chiller

plumbed into the same (2-pipe) hydronic loop provides cold water when the system is in cooling mode. This chiller plant will be smaller than the Option A plant since the DOAS units will provide part of the total cooling needed. When in heating mode, the DOAS will supply extra-cool ventilation air to the fan coils for optimum humidity control and to delay the need to switch the hydronic system to cooling mode. Some fan coil units will be equipped with small electric heating coils to accommodate zones that still need some heating when the hydronic system eventually shifts to cooling mode.

Areas that need high ventilation rates, cooling during winter, or high-efficiency filtration (surgery, for example) will be served directly from a DOAS unit with electric reheat terminal units.

E7 Benefits: Comfortable indoor humidity during mild, rainy days. Odors generated in one area are less likely to be recirculated to other areas. Smaller central air handling equipment results in less noise near equipment.
E8 Benefits: Fan coil units are very small and simple in concept. A fan coil unit failure only takes a small area out of service. Multiple, small DOAS units can serve a common distribution system so a unit failure does not take any space out of service. Stocking of spare parts on site is very practical. Less return ductwork means less duct cleaning. Otherwise, maintenance cost will be higher due to the location and quantity of fan coil units and the roof mounted DOAS units will have a reduced life expectation.
E9 Benefits: This system is generally efficient since the need for reheating is minimal and fan energy is reduced. Efficiency will be further enhanced since the DOAS units will have heat recovery and economizer cooling.
E10 Benefits: Mechanical costs may be similar to Option A. Offsetting cost advantages will include smaller ductwork allowing a lower ceiling-to-structure space (reduced general construction cost) fewer mechanical rooms will allow a smaller building (reduced general construction cost).

Option D – Fan Coil System with DOAS Units and Hydronic Ground Source Heat Pump

Same as Option C except the chiller would be replaced with a water-to-water ground source heat pump system sized for the summer cooling load. Since a ground source system has limited ability to provide heat in a climate that is heavily dominated by heating needs, boilers will still be required but slightly smaller in size. The external bore field will be sized appropriately for the total summer heat contribution from cooling.

E7 Benefits: Same as Option C
E8 Benefits: Same as Option C but with increased maintenance associated with the ground source system.
E9 Benefits: Reduced energy consumption since some of the heating energy will be provided by the ground source heat pump. Cooling energy may not be much different since the Option C air cooled chiller will be very efficient with the low summer outside air temperature.
E10 Benefits: This should be considered a relatively expensive system to install.

Other HVAC Systems

- Controls: Conventional DDC controls are anticipated. A fully-loaded/licensed central work station and separate laptop computer (for off-site monitoring) will be included. Full building

graphics, monitoring and adjusting capabilities via either computer. Manufacturer training for at least two individuals.

- Humidification: Electric humidifiers with duct-mounted, short-dispersion manifolds will be needed for each VAV air handler or DOAS unit.
- High efficiency filtration: MERV 14 downstream filtration will be required for each VAV air handler or DOAS unit. DOAS filtration will be about 35% of the sized needed for VAV air handlers.
- Steam: Steam boilers are not anticipated. It is assumed that CS and kitchen equipment will be electric.
- Miscellaneous ventilation and heating: Convention wall exhausters and unit heaters in utility rooms. Electric or hydronic heaters in entrance vestibules.

NAC
ENGINEERING

D50 - ELECTRICAL SYSTEMS – Downtown Site

Electrical Service:

Electrical Distribution

- Primary medium voltage service from the utility company location will be as directed by utility company. Primary underground will be extended from nearest power source on the street which is overhead to the new service yard that will enclose the padmounted transformer. The existing primary overhead distribution system currently routes down 2nd street where the new hospital and clinics main entrance will be located. Therefore, this primary distribution line will need to be relocated. This line appears to feed the high school further down the street. Pending discussions with Alaska Power and Telephone, it is anticipated that the line will need to be intercepted at 2nd and Fram street, rerouted over to 3rd street and then back to 2nd at Excel street.
- Main electrical service to be a single 480Y/277 VAC 3-phase 4-wire main switchboard with a single main overcurrent breaker. Preliminary size based on building square footage and assuming electric heating will be 4,000 amps. This service will be dedicated to the new hospital construction. The existing service will be maintained to operate the hospital during the phased construction of the hospital. Once construction is completed, the existing hospital will be demolished. A new temporary service may be necessary to maintain the clinic's operation while the existing hospital is demolished. It is believed that the clinic is currently served by the main switchboard in the hospital.
- Dry type low voltage transformers will be used to step the voltage down to from 480Y/277 volt to 208Y/120 volt systems. These transformers will be aluminum wound with 115 degree C rise NEMA 2 enclosures and located in select electrical rooms.
- Demand metering is to be provided on the main service disconnecting breaker via Power Logic, or compatible equipment.
- Surge protection is to be provided at the main service entrance and on load side of dry-type transformers that supply 208-volt panelboards serving sensitive loads such as computer centers and IT equipment. All Life Safety, Critical branch, and legally required panelboards will be provided with Surge Protective Device (SPD) protection.
- 208Y/120 VAC panelboards for lighting circuits will be distributed throughout the building and generally located in electrical rooms. Panelboards for spaces such as the kitchen will be locally located in the space.

- 208Y/120 VAC distribution panelboards and motor control equipment for mechanical equipment circuits will be specified for mechanical equipment and located in the area being served where space allows.
- 208Y/120 VAC panel boards for receptacle and miscellaneous circuits will be specified using a radial distribution system with local of distribution boards. Panelboards and transformers will be located in electrical rooms and closets. Each floor devices shall be feed from a Panelboard located on that floor. Emergency loads will be feed from alternate floor located panels due to the limited number of circuits needed.
- Panelboards will be tin-plated aluminum bussed.
- Distribution feeders will be generally routed underground to each wing.
- Feeders 100 Amp and greater from the main electrical room to the wings will use compact aluminum feeders with hydraulically applied connection pin in the base bid. Other feeders will be based on copper conductors. All feeders will be based on copper provided as an alternate if the budget can support this expense.

Fire Pump Service:

- No fire pump service will be provided.

Emergency Electrical System:

- Main Hospital - A redundant (N+1) standby diesel generator(s) , located on the ground level, three 4-pole automatic transfer switches (ATS) and distribution panels rated at 208Y/120 volt are to be provided consisting of a dedicated life-safety branch, a critical branch, and an equipment branch. Paralleling gear will be designed to support the two generators. This Emergency Power Supply System (EPSS) is anticipated as being a level-01system where failure of the equipment to perform could result in loss of human life or serious injury. The EPSS equipment will be located in a separate 2-hour room and separated from the main electrical distribution equipment. Fuel will be #2 non-bio diesel with a minimum of 96-hours of run time. Due to the gallons required, a separate main tank with double wall construction will be needed with a transfer pump system to the day tank located in the generator room. A fuel polishing system will be required. A stationary load bank will be design to allow for automatic exercising of the generators on a monthly basis.
- Existing Hospital – existing EPSS will remain in operation during the phase of construction of the new hospital. Once complete, existing EPSS infrastructure shall be demolished. Existing 80kW and 250kW shall be salvaged. The existing 250kW generator will be considered for re-use for the new clinic. Re-use of generator will depend on whether it meets current EPA Tier emission regulations and provides adequate capacity for the buildings NEC 700 Life Safety and NEC 702 Optional Standby electrical demand.
- Clinic – A separate standby diesel generator will be used to feed the NEC-700 life safety system and the NEC-702 optional standby system. This system will have two dedicated ATSs. The EPSS is

anticipated as being a level-02 system where failure of the EPSS to perform is less critical to human life and safety. Re-use of the existing 250kW generator will be evaluated for use of the new clinic. If it does not pass the EPA Tier emission requirements or provide adequate capacity, a new generator will be planned for this building. A portable load bank can be used for annual testing. Fuel will be #2 non-bio diesel with a minimum of 24-hours of run time. It is estimated that this tank can be located below the generator in a belly tank configuration. A fuel polishing system will be not be required.

- A second generator output breaker for the clinic generator system will be specified for the generator system for an annual portable load bank for load test of the generator. This system will have a Trystar or similar generator bypass switch to allow for automatic disconnection of the load bank should utility power be lost during maintenance testing.
- Distribution and branch panels are to be provided for 120-volt loads. The generator unit to be provided with a base tank for minimum 8-hour operation. This generator is initially sized at 500 – 750 kW based on rough order of magnitude main hospital building square footage. The clinic will require a generator of rough order of magnitude of 200 – 350kW based on the clinic square footage and the desire to maintain full use of the facility. The generators are to be controlled for monthly testing via the building energy management control system.
- Generator will be fueled with #2 non-bio diesel. Bio-fuel can be investigate if so desired, but the generator manufacturers' have limitations on the level of bio-fuel that can be effectively used.
- Generation is to comply with NEC article 517 (Health Care Facility) for the main hospital and NEC articles 700, 701, 702 for the Clinic. These systems will serve life safety emergency exit and egress lighting, fire alarm system, security system, communication rooms, building automated control (BAC) panels, air conditioning for communications rooms, and walk-in coolers. Distribution is via feeders, with branch panels for life safety, and optional equipment loads. A dedicated generator branch will be used to serve select IT equipment, IT air-handling, walk-in coolers and areas that require ventilation.
- Sound levels are to be in accordance with local *maximum environmental noise level requirements and restrictions where applicable and local city ordinances. The generator system will be located exterior to the building and have a sound attenuated enclosure.

Emergency Life-Safety Loads

Egress lighting & exit signage, alarm and alerting systems, communication systems	Generator power. Additional battery packs provided in main electrical room where Automatic Transfer Switch (ATS) is located per NFPA-110 (Generator) Code.

Critical Loads

Equipment necessary for operation	Patient Bed/Critical Care

Telephone	Main switch and related equipment
Nurse-call/Code Blue system	Main equipment and supporting apparatus
Nurse-assist system	Main equipment and supporting apparatus
Misc equipment	Equipment and components as determined by the facility manager that are essential to operations. This can include things such as coffee makers, computer systems, etc.

Standby/Equipment Loads

Hydronic circulating pumps	Boiler and AC loops, include control circuits for any gas fired boilers
Owner data network	Power and equipment for all IDFs and MDF; include spare receptacles & A/C
BMS system	DDC controls
Fire Sprinkler & Alarm system	FACP, NAC panels, dry system compressors, magnetics locks, & any other associated device requiring power.
Generator accessories	Block heater and battery charger
Heat trace	Any heat trace installed to prevent system freezing
HVAC control system	Some items on this list would not operate w/o BMS controls
Phone system	Believed to be part of IT system. Dedicated circuits to phone headend will be provided
Security system	Includes intrusion, CCTV, card access system, front-door intercom, components may be scattered through the building(s)
Sump Pumps (if applicable)	For sub-grade drainage or sewage
Walk-in cooler/freezer	Optional per Owner request. Generally, these will hold cold for several hours and the large additional increase in generator may not be warranted.
Lighting	All restrooms, area light by generator for refueling, electrical room(s), mechanical room(s), MDF room and demarc room

Convenience outlets:	
- Health type rooms	Medical refrigerator(s)
- Facility manager office	phone / laptop / computer / emerg. radio / security computer / etc.
- Operations Manager	phone / computer / radio
- Security office, if desired	computer / radios / security camera head-end
- Kitchen/Food Service	Microwave and other select items as directed by the Owner
- Custodial office	HVAC/BMS computer/radio
- Additional areas	Common spaces, emergency storage & generator

Note: All generator backed receptacles to be red/orange in color for easy identification

- Select lighting for commons areas where kids may be held while being picked up during a power outage
- Mechanical DDC system

Uninterruptible Power System:

- No UPS equipment will be provided.
- If communication rooms are to have local UPS units at equipment racks, they will be provided by the Owner.
- X-ray and related equipment to be provided with UPS if so desired by the equipment supplier.

Grounding:

- The grounding system is to be in accordance with the National Electrical Code. The building ground is to consist of a UFER ground system with other grounding electrodes consisting of water service, and building steel. Interior metallic systems will be bonded together per NEC requirements. A telecommunication grounding riser will be provided with copper ground bars located as each telecommunication room. Driven ground rods will be provided for separately derived systems where other grounding means are not available.
- Grounding of raceway systems and distribution equipment cabinets is to consist of an insulated green equipment grounding conductor routed with the phase conductors and bonded at each panelboard and at intermediate pull boxes. The raceway system will not be used as the sole means of grounding.

- Cable trays throughout the building are to be bonded to building steel at multiple locations to create a low impedance signal ground in addition to being grounded at the main service. A bare copper ground wire will be routed with the cable tray and bonded to each section of the tray.
- A communication grounding system is to be provided per TIA/EIA-607 standards bonding all communications rooms to service ground and building steel. Ground bus bars are to be provided in each communication room.
- An isolated ground distribution system and isolated ground receptacles will be specified for patient care areas.

Lightning Protection:

- A lightning protection system will not be provided, but should be looked at.

Power:

- Wall receptacles are to be provided in offices, computer rooms, and room spaces. Floor boxes are to be located only where normal wall service would not accommodate the need such as teaching podiums. Tamper-resistant receptacle will be used in public accessible locations.
- Lab benches are to be provided with dual channel aluminum surface metal raceways. Single and three phase 208-volt receptacles are to be provided in laboratory spaces. Dedicated circuits shall be provided to serve equipment areas.
- 120-volt receptacles are to be provided on the building exterior for future electric vehicle charging and general Owner usage if directed by the Owner.
- Power poles are not to be used unless wall or floorbox service is not possible or there exists a need for easy relocation of power items.
- Receptacles in corridors will be placed on a maximum spacing of 50-ft for janitorial use.
- Display cases, if desired, will be provided with one duplex receptacle for general usage.
- General spacing of receptacles will be a maximum of 12-ft on-center with dedicated receptacles located for items such as vending machines, copy/fax machines, computers, and other like equipment.
- Receptacles on reception desk counters and like spaces will be on 4-ft centers. Where possible, receptacle for counter computer stations will be located below counter in the knee space with grommeted openings for cabling.
- Dedicated power will be provided for door control systems such as powered doors or door locking systems.
- Branch circuit wiring will be based on health-care rated MC cable with copper conductors and separate neutrals. Homeruns will be hard-piped back to the local panelboards from a distribution junction box in the vicinity of the loads being served. Additional concealed and

accessible junction boxes will be provided with hard-pipe interconnection to form a distribution backbone that can support future conductor additions from the room to the panelboard. MC cable will be radially connected to these distribution junction boxes following a spoke and hub design.

- The State of Alaska does not have a state code and follows the 2012 International Energy Conservation Code (IECC). We feel that energy conservation is an important aspect of facility longevity, sustainability and general good practice energy conservation. Hence we recommend following the Washington State Energy Code (WSEC) as it has proven to provide better performance than the IECC and is relatively cost effective since we will primarily be using LED style lighting. Per the current WSEC - At least 50 percent of all 125 volt 15- and 20-ampere receptacles installed in private offices, open offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, individual workstations and rooms, including those installed in modular partitions and modular office workstation systems, shall be controlled as required by this section. In rooms larger than 200 square feet (19 m 2), a controlled receptacle shall be located within 72 inches (1.8 m) of each uncontrolled receptacle. Controlled receptacles shall be visibly differentiated from standard receptacles and shall be controlled by one of the following automatic control devices:
    - 1. An occupant sensor that turns receptacle power off when no occupants have been detected for a maximum of 20 minutes. This is the option we plan to use.
    - 2. Alternate approach - A time-of-day operated control device that turns receptacle power off at specific programmed times and be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building not to exceed 5,000 square feet (465 m2) and not to exceed one full floor. The device shall be capable of being overridden for periods of up to two hours by a timer accessible to occupants. Any individual override switch shall control the controlled receptacles for a maximum area of 5,000 square feet (465 m2). Override switches for controlled receptacles are permitted to control the lighting within the same area. This option can be used if so directed by the Owner.

Interior Lighting:

- The lighting system will be designed primarily based on use of lay-in 4500 to 5400 lumen volumetric style LED luminaires with electronic, high power factor, low harmonic served at 277 volts.
- Lamp color shall be the Owner standard. It is believed to be 3500ºK with a minimum CRI of 80.
- Human centric lighting will be explored in patient care areas. This requires special luminaires and more complicated controls to mimic circadian rhythms. It does add around $3/sft to the cost of the initial building design and does not use any additional energy as compared to a conventional on/off daylight harvesting system.

- Exit lights with LED lamps and emergency egress pathway lighting are to be provided and connected to the emergency distribution system. Exit lights shall be no more than 5 watts. Exit lights shall be red letters on a white face.
- The lighting system shall meet current 2015 Washington State NREC energy code.
- Indirect LED volumetric troffers are to be used in offices and other similar areas.
- LED grid volumetric/lensed luminaires are to be used in corridors and controlled via local low-voltage wall switches interconnected with the DDC and lighting control system. Local switches provide an over-ride of the system for a short period of time. The system selected should be specified to ignore the switches during scheduled times of day to avoid undesired switching.
- Life safety exit and egress lighting to remain on 24/7 as that is the intended use of the facilities.
- Direct/indirect (volumetric) lay-in grid-mounted linear LED fixtures with lenses on the direct downlight component in offices, laboratories, and conference rooms.
- Recessed LED accent down lighting to be used where applicable.
- Multi-level daylight zone controls for laboratories, and office lighting are to be provided. System will be digital and distributed.
- Automatic daylight harvesting has been interfaced with the localized digital control system in each room.
- Building interior lighting in common areas is to be controlled by DDC via a low voltage control system with computer control, relay panels and local low voltage switching, for compliance with energy code. Controls will be located at the nurse's station to allow for night-time dimming of corridors.
- Lighting control system will be based on an nLight system with luminaire level controls. Common/central core areas will be controlled from centralized network panels that are interconnected. The system would be specified to allow at least 3 different manufacturer's to bid.
- Occupancy sensors will be used in offices, conference/work rooms, corridors and restrooms per energy code requirements.
- Excessive brightness and glare shall be controlled in all instructional areas.
- Lighting levels will follow Washington Administrative Code (WAC) and Illuminating Engineering Society of North America (IESNA) recommended levels. Follow are the general guidelines:

    a. Lighting levels in patient rooms will be 20 - 30 foot-candles.
        i. Examinations will be designed for 100 foot-candles
    b. Lighting levels in offices will be 30 - 40 foot-candles.
    c. Lighting levels at the nurse's station will be 30-50 foot-candles.
    d. Lighting levels at the pharmacy will be 70-90 foot-candles.
    e. Lighting levels in stairwells and corridors will be 10 - 20 foot-candles.
    f. Lighting levels in mechanical equipment and electrical rooms will be 40 - 50 foot-candles.
    g. Lighting levels in telecommunications rooms will be 40 - 50 foot-candles.

h. Lighting levels in labs will be 50 - 60 foot-candles.
i. Lighting levels in the surgical rooms will be approximately 150 foot-candles and require dedicate examination lights.
j. Lighting levels in examination rooms will be 50 – 70 foot-candles.
k. Lighting levels in soiled and clean utility type rooms will be 30 - 40 foot-candles.
l. Lighting levels in food service/kitchen area will be 50 - 60 foot-candles.
m. Lighting levels at building exterior entrances will be 2 – 5 foot-candles.
n. Lighting levels at building exterior pathways will be 1 – 2 foot-candles.

Exterior Lighting:

- Site lighting will be tightly controlled to areas of egress, pedestrian paths and parking areas. Luminaires will be LED with dusk-to-dawn full operation. Luminaires will be dark sky compliant, with distribution types carefully controlled to avoid light trespass and light pollution.
- Exterior lighting will be automatically controlled. Lighting will generally be wall-mounted LED for building perimeter. Other area lighting around building, pedestrian pathways, and within parking area will be pole-mounted LED.
- Building egress and entrances will be connected to the standby generator per Code requirements.

Fire Alarm System:

- Existing fire alarm systems will be maintained for both the hospital and clinic for the duration of construction. Upon completion of each of construction, the fire alarm system in its entirety shall be demolished. Retention of any existing equipment shall be at the discretion of the owner. The existing fire alarm main panel will need to be relocated to the clinic during the demolition and construction of the new hospital. Once the new hospital portion is operational, the existing clinic can be demolished and the new clinic can be interfaced with the new system provided in the hospital.
- Multiplexed, addressable fire alarm system with mylar speakers and strobes to comply with ADA and local codes.
- Corridor and common area smoke detection will be specified as a minimum. If there are a significant number of duct smoke detectors required by the mechanical system layout, then total area coverage will be used instead.
- Raised floor areas will require detection below the floor in addition to the room space per NFPA 72 requirements. None are envisioned at this time.
- Fire separation doors will have 120 VAC electro-magnetic hold open devices which will be released by the fire alarm system.
- Building is equipped with an elevator so connections for elevator recall are needed.

- Fire/smoke dampers will be a zoned shutoff system. Position switches to confirm open for motorized dampers will not be provided.
- System will be a voice alarm system to allow paging and emergency announcements throughout the building.
- Fire alarm system will be based on the Owner fire alarm system standard. Currently this is unknown.
- 24-hour battery backup for the fire alarm system will be required in addition to generator backup.
- The contractor will provide the necessary programming of the fire alarm control panel.
- Building exterior notification devices, with amber visual signals, will be provided to identify building lockdown activation.
- 100% area detection is being considered for the Windsor site as the local AHJ has indicated that employing 100% area detection could reduce the fire water storage tank size. Cost evaluations are underway to see if there is an economic advantage of the 100% detection. The building is fully sprinkled.

Telecommunications:

- In addition to the overhead primary power distribution line there is fiber optic distribution on the same poles as the power and this would also require relocation to accommodate the new main entry for the hospital and clinic.
- The existing telecommunication infrastructure shall be maintained for both the hospital and clinic for the duration of construction. Upon completion of each of construction phase, the telecommunication network infrastructure in its entirety shall be demolished. Retention of any existing equipment shall be at the discretion of the owner. The existing MDF will need to be relocated to the clinic side to keep the clinic in operation while the hospital is demolished. It is intended that the MDF will reside in the new hospital and a new IDF will be provided in the clinic.
- Voice services will be copper and originate from the servicing utility companies demarcation cabinet located in the Main Distribution Frame (MDF) on the basement or first floor. A temporary new incoming service will be required to feed the clinic during the demolision and construction of the new hospital building.
- Copper and optical fiber horizontal distribution system within the building to support voice and data networks. A Telephone\Data Main Distribution Frame (MDF) entrance room shall be provided on the first level with access to the first floor pathways. Distributed communication Intermediate Distribution Frame (IDF) rooms shall be provided to minimize cable runs to 90 meters. This 90 meter length to be total length including patch cords of up to 5 meters. Connection between the MDF and IDF closets will be via underground raceway systems.

- IDF communication rooms shall be located toward the center of the building wings and not at the edges of each floor where possible. IDF communications rooms will be dedicated rooms located on the catwalk level.
- Each floor wing will be configured such that the station cables are terminated on the floor/wing that serve the corresponding Work Area Outlet (WAO) except where space does not allow for an IDF room per wing. In those locations, WAO station cables will terminate at the closest IDF or MDF. Jack and cable color and labeling will be per the Owner Standards.
- A complete telephone and data cabling system shall be provided throughout the facility. System shall be installed in accordance with TIA/EIA 568B standards, and in general will include Category 6A cable runs to all workstations and printer locations, terminated at station outlet jacks patch panels using RJ45 connections at the IDF communication rooms. The system will be designed to support 10 GB/s distribution.
- Fiber optic backbone cable will be provided between the entrance room and all distributed communication rooms. 8.3 micron SM Fiber optic cables will also be provided to server rooms and certain dedicated workstations where higher level of future bandwidth is anticipated. 6-strand MM OM3 50-micron and/or 8.3 micron SM fiber optic cabling will be designed between MDF and IDF rooms. Currently, the Owner has chosen 6-strand MM OM3 and 6-strand SM cabling. Terminations will be based on TeraSPEED SM duplex LC adapters.
- Color code for cables shall be as follows unless otherwise directed by the Owner:
    - Blue: Data and Voice
    - White: Security Cameras, Meters, Facilities
    - Violet/Purple: IP Clocks and Intercoms
    - Orange: Wireless Access
    - Black: Access Control
- Standard station outlets will include cabling for two (2) RJ-45 jacks on a common single-gang stainless steel faceplate. Faceplate colored icons shall be as follows:
    - Top Left – white
    - Top Right – Orange
    - Bottom Left – Blue
    - Bottom Right – Blank
- Labeling scheme will use MDF/IDF destination name. Examples - IDF_200 1-3; HS_406 1-3
- A complete wire-basket cable tray, ladder runway, and raceway system shall be provided for the facility. Cable tray will be routed in the mezzanine level. Underground raceways with a minimum of (1) 4" spare will be provided from the MDF to each IDF and (1) 4" spare from each IDF to the adjacent IDF to form a ring. This is a precaution for future additions or cable repair. It also affords the Owner the ability to create a self-healing network backbone.

- Cable tray and conduit shall be routed from the MDF entrance room to all distributed IDF communication rooms. Distribution cable tray shall be run from distributed communication rooms to areas with large concentrations of outlets or through main corridors as to provide easy access with minimal occupant disruption. Where possible, cabling shall be routed below raised floors and rated for the environment. Cable tray system will be based around a wire basket style tray with a maximum of 30% fill. Minimum size will be 12"W with a 4" loading depth.
- Raceways shall be provided from cable trays to all outlets. Ladder rack shall be provided in all communication rooms.
- Telephone handsets, and personal computers will be provided by the Owner.
- WiFi LAN system based on 802.11b standards will be required for interior hallways, common spaces and other select rooms that require wireless access points (WAPs) for wireless networking primarily used by the students. Offices will generally not be provided with wireless provisions. Some offices rooms may be able to utilize the wireless system based on the distribution locations for the WAPs. The wireless network will use power over Ethernet (PoE) for powering the WAPs. System to be designed around Aruba 7205 with Aruba AP-205 components.
- 2 data cables to each WAP will be provided.
- Category 6A augmented copper UTP with bonded pairs cabling will be used for horizontal cabling. Some select locations will be provided with fiber optic data ports as directed by the Owner's IT department. Wall locations may use Category 6A as dictated by the Owner's IT department.
- Horizontal and Vertical wire management will be provided at each rack/cabinet. Wire management will be 6" wide for vertical support on both sides of the rack with a common/shared vertical wire management where racks adjoin. Between each 48-port patch panel a 2RU wire management unit will be shown. Between each 24-port patch panel a 1RU wire management unit will be shown.
- A 50-pair Cat 3 phone backbone will be provided between the MDF and the IDF rooms. This cable will punch down on 110 blocks and can be used for cross-connects for older analog equipment that the Owner may want to re-use that is not IP-based at current time.
- Owner standard manufacturer is unknown.

The follow is a table of items to discuss to determine what is to be provided in the contract and what will be an FF&E item:

System ID		Description	Contractor Furnished Contractor Installed (CFCI)	Owner Furnished Contractor Installed (OFCI)	Owner Furnished Owner Installed (OFOI)
1		***Telecommunications Distribution System***			

	.01	Device conduit rough-in	x		
	.01	Open cabling supports / Cable Tray	x		
	.03	Category 6A cabling for Work Area Outlets (WAO)	x		
	.04	Category 6A cabling for wireless access points	x		
	.05	Wireless Access Points			x
	.06	Optical fiber & copper back bone cabling	x		
	.07	IT equipment racks & ladder rack	x		
	.08	Fiber & conduit to High MDF demarc	x		
	.09	UPS in Telecommunications Room		x	
	.10	PDU's in Telecommunications Room		x	
	.11	Power receptacles for telecommunications rooms	x		
	.12	HVAC cooling equipment for telecommunications rooms	x		
	.13	IT grounding & Bonding infrastructure	x		
	.14	Firestopping for IT pathways	x		
2		***IP Centralized Clock System***			
	.01	Device conduit rough-in	x		
	.02	IP clock combo device & patch cord (device end only)	x		
	.03	IP clock specialty back box	x		
	.04	IP digital clocks	x		
	.05	Analog speakers, zone controllers and paping amplifiers	x		
	.06	Analog speaker specialty back box	x		
	.07	Analog speaker cabling & connectivity	x		
	.08	software licenses			x
	.09	software, servers and programming			x
3		***Audio Visual System***			
	.01	Device conduit rough-in	x		

	.02	Interactive ultra short throw LCD video projector		x	
	.03	Video projector mount and mast	x		
	.04	VGA (video)/audio input device and cabling	x		
	.05	HDMI device and cabling	x		
	.06	Audio Video network switcher	x		
	.07	Sound enhancement speaker system (per room)	x		
	.08	Audio Video network software	x		
	.09	USB switcher, extender and input device	x		
	.10	Wireless microphone, base charger and IR sensor	x		
4		***Telephone System***			
	.01	Telephone Devices (handsets)			x
	.02	Telephone servers, programming, and licensing			x
5		***Network System***			
	.01	PC workstations and monitors			x
	.02	Network electronics			x
	.03	Category 6 patch cords for telecommunications room & workstations			x
	.04	Network programming and QOS scheduling			x
	.05	Network servers, programming and licensing			x
	.06	Ethernet switches (PoE and non-PoE)			x
6		***Security - Access Control System***			
	.01	Device conduit rough-in	x		
	.02	Electrical connections	x		

	.03	Low voltage cabling, security devices and terminations	x		
	.04	Access control equipment & programming	x		
7		***Security - IP Surveillance System***			
	.01	Device conduit rough-in	x		
	.02	IP surveillance cameras & patch cords (device end only)	x		
	.03	Software, cameras and licenses	x		
	.04	Physical servers and storage - NVR	x		
	.05	VMS programming			x
7		***Nurse Call System***			
	.01	Device conduit rough-in	x		
	.02	Devices	x		
	.03	Headend equipment	x		
	.04	Cabling, devices and terminations	x		
	.05	Programming and testing	x		
8		***Distributed Antenna System (Required?)***			
	.01	Device conduit rough-in	?		
	.02	Headend equipment	?		
	.03	Cabling, devices and terminations	?		
	.04	Programming and testing	?		
10		***Audio Visual Distribution Systems***			
	.01	Recessed AV wallbox and device conduit rough-in	x		
	.02	LCD flat panel display			x
	.03	Universal wall mount		x	
	.04	Network media player, licenses and software			x
	.05	Programming			x

CATV System:

- A coax style CATV system will not be provided as IPTV has replaced most TV distribution systems. IPTV systems generally run over the data network. Devices will be located in each patient area and in waiting rooms.

CCTV System:

- Existing CCTV system shall be maintained for both the hospital and clinic for the duration of construction. Upon completion of each of construction phase, the CCTV infrastructure in its entirety shall be demolished. Retention of any existing equipment shall be at the discretion of the owner.
- A limited security CCTV system will be required. This system will be remotely monitored and will include network video recorders (NVR). The NVRs will be located in the telecommunications rooms and configured for connectivity to the Ethernet network. Monitoring of the system will be via a Windows-based software package installed on a dedicated computer for the Security Resource Officer (SRO) usage.
- The security CCTV system will be continuously monitored. Software triggers can be implemented to reduce the recording data amount.
- Cameras for the security CCTV system may require TCP/IP addressing capability.
- A security surveillance type system with cameras and monitors is to be included for corridors and entry doors and elevator.
- Active components will be furnished by the Owner. This includes cameras and head-end equipment such as network video recorders and storage. Cabling will be part of the building infrastructure contract.
- Anticipated camera locations are the main entrances, waiting areas, and potentially parking lots.

Audio/Video:

- Mediated training rooms shall be equipped with presentation systems consisting of a video/graphics projection system and multimedia sources, including document camera, VCR's, DVD/CD players and connections for personal computers or laptops. All mediated rooms shall be provided with program audio systems and larger meeting/community rooms shall also be provided with voice reinforcement systems.
- Mediated rooms shall be provided with control systems based on the Owner standards. Multimedia sources shall be located in the Instructor's podium and/or media.

- Video projectors will be based primarily around an Ultra-Short Throw projection system without interactive capability. These will be wall mounted above the front teaching whiteboard. Dalite style projection boards will be used over standard whiteboards for better visibility and contrast.
- There will be either flat panel display or ultra-short throw projectors with screens in the commons for daily events display. Cost comparisons between the two options are in progress.
- Assistive listening systems shall be provided in all rooms with 40 seats or more, if such space is applicable. Headsets are checked out to individual users by the Instructor.

Intercommunication/Public Address System:

- Existing intercom system shall be maintained for both the hospital and clinic for the duration of construction. Upon completion of each of construction phase, the intercom system infrastructure in its entirety shall be demolished. Retention of any existing equipment shall be at the discretion of the owner.
- The building interior and exterior will be provided with a public address system consisting of speakers and interconnections to sound re-enforcement system using a priority override. Paging capability will be combined with the room clock/speakers system, locker rooms, commons, corridors and similar general usage spaces.
- Paging will be provided for a minimum of 10 zones with expandability to a minimum of 16 zones.
- System will be based on Owner Standards. This is believed to be a Rauland Telecenter.
- The Owner furnished VoIP telephone system will be interfaced to this system to allow for room-to-room communication or general announcement broadcasting.

Clock System:

- Individual room and the nurse's station clocks with synchronization using SNTP will be specified. Size is expected to be based on standard 12" digital-style clocks.
- Surgical rooms will have standard time of day clocks and additional procedure clocks.
- Commons area will be provided with 12" or larger analog-style clocks.
- The clock system will use SNTP for synchronization and will be Ethernet-based. The clocks will connect to the Rauland Telecenter system using network/Ethernet style cabling.

Access Control:

- Existing access control system shall be maintained for both the hospital and clinic for the duration of construction. Upon completion of each of construction phase, the access control

infrastructure in its entirety shall be demolished. Retention of any existing equipment shall be at the discretion of the owner.

- The building requires an exterior access control system for selected doors. Access control will be via proximity cards. The system will be based on Owner standards.
- Keypads will be located at select main entry points for arming/disarming the system.
- The building will be configured for multiple zones to allow kitchen staff to enter and leave without disruption of the overall building protection. Zone discussions will be required between the Engineer and the Owner so these can properly be indicated on the construction documents.
- 24-hour battery backup in addition to generator power will be required for the access control system. This system will be feed from the NEC 702 optionally standby system.
- Perimeter doors are to be provided with door switches and proximity card reader access control.
- Intrusion detection will also be provided in the corridors and select perimeter rooms classified as "High Risk" areas such as computer labs, science rooms, etc.
- The Owner is currently working with their vendor of choice on a system design. Once selected, the vendor and the engineer will work together to depict the system installation on the construction documents.

LEED Credits (if LEED Certification is desired):

- Following is a list of Leadership in Energy and Environmental Design (LEED) points that will be sought after:
    - Sustainable Site – Outdoor Lighting – Light Pollution Reduction (1 pt)
    - Energy and Atmosphere – Superior Energy Performance (1 pt)
    - Energy and Atmosphere – Green Power and Carbon Offsets (0 pt), Generally an expensive item
    - Indoor Environment Quality – Electric Light Quality (1 pt)

NAC
ENGINEERING

D50 - ELECTRICAL SYSTEMS – Greensfield Site

Electrical Service:

Electrical Distribution

- Primary medium voltage service from the utility company location will be as directed by utility company. Primary underground will be extended from nearest power source to the new service yard that will enclose the padmounted transformer.
- Main electrical service to be a single 480Y/277 VAC 3-phase 4-wire main switchboard with a single main overcurrent breaker. Preliminary size based on building square footage and assuming electric heating will be 4,000 amps.
- Dry type low voltage transformers will be used to step the voltage down to from 480Y/277 volt to 208Y/120 volt systems. These transformers will be aluminum wound with 115 degree C rise NEMA TP1 enclosures and located in select electrical rooms.
- Demand metering is to be provided on the main service disconnecting breaker via Power Logic, or compatible equipment.
- Surge protection is to be provided at the main service entrance and on load side of dry-type transformers that supply 208-volt panelboards serving sensitive loads such as computer centers and IT equipment. All Life Safety, Critical branch, and legally required panelboards will be provided with Surge Protective Device (SPD) protection.
- 208Y/120 VAC panelboards for lighting circuits will be distributed throughout the building and generally located in electrical rooms. Panelboards for spaces such as the kitchen will be locally located in the space.
- 208Y/120 VAC distribution panelboards and motor control equipment for mechanical equipment circuits will be specified for mechanical equipment and located in the area being served where space allows.
- 208Y/120 VAC panel boards for receptacle and miscellaneous circuits will be specified using a radial distribution system with local of distribution boards. Panelboards and transformers will be located in electrical rooms and closets. Each floor devices shall be feed from a Panelboard located on that floor. Emergency loads will be feed from alternate floor located panels due to the limited number of circuits needed.
- Panelboards will be tin-plated aluminum bussed.
- Distribution feeders will be generally routed underground to each wing.

- Feeders 100 Amp and greater from the main electrical room to the wings will use compact aluminum feeders with hydraulically applied connection pin in the base bid. Other feeders will be based on copper conductors. All feeders will be based on copper provided as an alternate if the budget can support this expense.

Fire Pump Service:

- No fire pump service will be provided.

Emergency Electrical System:

- Main Hospital - A redundant (N+1) standby diesel generator(s) , located on ground level, three 4-pole automatic transfer switches (ATS) and distribution panels rated at 208Y/120 volt are to be provided consisting of a dedicated life-safety branch, a critical branch, and an equipment branch. Paralleling gear will be designed to support the two generators. This Emergency Power Supply System (EPSS) is anticipated as being a level-01system where failure of the equipment to perform could result in loss of human life or serious injury. The EPSS equipment will be located in a separate 2-hour room and separated from the main electrical distribution equipment. Fuel will be #2 non-bio diesel with a minimum of 96-hours of run time. Due to the gallons required, a separate main tank with double wall construction will be needed with a transfer pump system to the day tank located in the generator room. A fuel polishing system will be required. A stationary load bank will be design to allow for automatic exercising of the generators on a monthly basis.
- Clinic – A separate standby diesel generator will be used to feed the NEC-700 life safety system and the NEC-702 optional standby system. This system will have two dedicated ATSs. The EPSS is anticipated as being a level-02 system where failure of the EPSS to perform is less critical to human life and safety. A portable load bank can be used for annual testing. Fuel will be #2 non-bio diesel with a minimum of 24-hours of run time. It is estimated that this tank can be located below the generator in a belly tank configuration. A fuel polishing system will be not be required.
- A second generator output breaker for the clinic generator system will be specified for the generator system for an annual portable load bank for load test of the generator. This system will have a Trystar or similar generator bypass switch to allow for automatic disconnection of the load bank should utility power be lost during maintenance testing.
- Distribution and branch panels are to be provided for 120-volt loads. The generator unit to be provided with a base tank for minimum 8-hour operation. This generator is initially sized at 500 – 750 kW based on rough order of magnitude main hospital building square footage. The clinic will require a generator of rough order of magnitude of 200 – 350kW based on the clinic square footage and the desire to maintain full use of the facility. The generators are to be controlled for monthly testing via the building energy management control system.
- Generator will be fueled with #2 non-bio diesel. Bio-fuel can be investigate if so desired, but the generator manufacturers' have limitations on the level of bio-fuel that can be effectively used.

- Generation is to comply with NEC article 517 (Health Care Facility) for the main hospital and NEC articles 700, 701, 702 for the Clinic. These systems will serve life safety emergency exit and egress lighting, fire alarm system, security system, communication rooms, building automated control (BAC) panels, air conditioning for communications rooms, and walk-in coolers. Distribution is via feeders, with branch panels for life safety, and optional equipment loads. A dedicated generator branch will be used to serve select IT equipment, IT air-handling, walk-in coolers and areas that require ventilation.
- Sound levels are to be in accordance with local *maximum environmental noise level requirements and restrictions where applicable and local city ordinances. The generator system will be located exterior to the building and have a sound attenuated enclosure.

Emergency Life-Safety Loads

Egress lighting & exit signage, alarm and alerting systems, communication systems	Generator power. Additional battery packs provided in main electrical room where Automatic Transfer Switch (ATS) is located per NFPA-110 (Generator) Code.

Critical Loads

Equipment necessary for operation	Patient Bed/Critical Care
Telephone	Main switch and related equipment
Nurse-call/Code Blue system	Main equipment and supporting apparatus
Nurse-assist system	Main equipment and supporting apparatus
Misc equipment	Equipment and components as determined by the facility manager that are essential to operations. This can include things such as coffee makers, computer systems, etc.

Standby/Equipment Loads

Hydronic circulating pumps	Boiler and AC loops, include control circuits for any gas fired boilers
Owner data network	Power and equipment for all IDFs and MDF; include spare receptacles & A/C
BMS system	DDC controls
Fire Sprinkler & Alarm system	FACP, NAC panels, dry system compressors, magnetics locks, & any other associated device requiring power.
Generator accessories	Block heater and battery charger
Heat trace	Any heat trace installed to prevent system freezing
HVAC control system	Some items on this list would not operate w/o BMS controls
Phone system	Believed to be part of IT system. Dedicated circuits to phone headend will be provided
Security system	Includes intrusion, CCTV, card access system, front-door intercom, components may be scattered through the building(s)
Sump Pumps (if applicable)	For sub-grade drainage or sewage
Walk-in cooler/freezer	Optional per Owner request. Generally, these will hold cold for several hours and the large additional increase in generator may not be warranted.
Lighting	All restrooms, area light by generator for refueling, electrical room(s), mechanical room(s), MDF room and demarc room
Convenience outlets:	
- Health type rooms	Medical refrigerator(s)
- Facility manager office	phone / laptop / computer / emerg. radio / security computer / etc.
- Operations Manager	phone / computer / radio
- Security office, if desired	computer / radios / security camera head-end
- Kitchen/Food Service	Microwave and other select items as directed by the Owner
- Custodial office	HVAC/BMS computer/radio

- Additional areas	Common spaces, emergency storage & generator

Note: All generator backed receptacles to be red/orange in color for easy identification

- Select lighting for commons areas where kids may be held while being picked up during a power outage
- Mechanical DDC system

Uninterruptible Power System:

- No UPS equipment will be provided.
- If communication rooms are to have local UPS units at equipment racks, they will be provided by the Owner.
- X-ray and related equipment to be provided with UPS if so desired by the equipment supplier.

Grounding:

- The grounding system is to be in accordance with the National Electrical Code. The building ground is to consist of a UFER ground system with other grounding electrodes consisting of water service, and building steel. Interior metallic systems will be bonded together per NEC requirements. A telecommunication grounding riser will be provided with copper ground bars located as each telecommunication room. Driven ground rods will be provided for separately derived systems where other grounding means are not available.
- Grounding of raceway systems and distribution equipment cabinets is to consist of an insulated green equipment grounding conductor routed with the phase conductors and bonded at each panelboard and at intermediate pull boxes. The raceway system will not be used as the sole means of grounding.
- Cable trays throughout the building are to be bonded to building steel at multiple locations to create a low impedance signal ground in addition to being grounded at the main service. A bare copper ground wire will be routed with the cable tray and bonded to each section of the tray.
- A communication grounding system is to be provided per TIA/EIA-607 standards bonding all communications rooms to service ground and building steel. Ground bus bars are to be provided in each communication room.
- An isolated ground distribution system and isolated ground receptacles will be specified for patient care areas.

Lightning Protection:

- A lightning protection system will not be provided, but should be looked at.

Power:

- Wall receptacles are to be provided in offices, computer rooms, and room spaces. Floor boxes are to be located only where normal wall service would not accommodate the need such as teaching podiums. Tamper-resistant receptacle will be used in public accessible locations.
- Lab benches are to be provided with dual channel aluminum surface metal raceways. Single and three phase 208-volt receptacles are to be provided in laboratory spaces. Dedicated circuits shall be provided to serve equipment areas.
- 120-volt receptacles are to be provided on the building exterior for future electric vehicle charging and general Owner usage if directed by the Owner.
- Power poles are not to be used unless wall or floorbox service is not possible or there exists a need for easy relocation of power items.
- Receptacles in corridors will be placed on a maximum spacing of 50-ft for janitorial use.
- Display cases, if desired, will be provided with one duplex receptacle for general usage.
- General spacing of receptacles will be a maximum of 12-ft on-center with dedicated receptacles located for items such as vending machines, copy/fax machines, computers, and other like equipment.
- Receptacles on reception desk counters and like spaces will be on 4-ft centers. Where possible, receptacle for counter computer stations will be located below counter in the knee space with grommeted openings for cabling.
- Dedicated power will be provided for door control systems such as powered doors or door locking systems.
- Branch circuit wiring will be based on health-care rated MC cable with copper conductors and separate neutrals. Homeruns will be hard-piped back to the local panelboards from a distribution junction box in the vicinity of the loads being served. Additional concealed and accessible junction boxes will be provided with hard-pipe interconnection to form a distribution backbone that can support future conductor additions from the room to the panelboard. MC cable will be radially connected to these distribution junction boxes following a spoke and hub design.
- The State of Alaska does not have a state code and follows the 2012 International Energy Conservation Code (IECC). We feel that energy conservation is an important aspect of facility longevity, sustainability and general good practice energy conservation. Hence we recommend following the Washington State Energy Code (WSEC) as it has proven to provide better performance than the IECC and is relatively cost effective since we will primarily be using LED style lighting. Per the current WSEC - At least 50 percent of all 125 volt 15- and 20-ampere receptacles installed in private offices, open offices, conference rooms, rooms used primarily for printing and/or copying functions, break rooms, individual workstations and rooms, including those installed in modular partitions and modular office workstation systems, shall be controlled

as required by this section. In rooms larger than 200 square feet (19 m 2), a controlled receptacle shall be located within 72 inches (1.8 m) of each uncontrolled receptacle. Controlled receptacles shall be visibly differentiated from standard receptacles and shall be controlled by one of the following automatic control devices:

- 1. An occupant sensor that turns receptacle power off when no occupants have been detected for a maximum of 20 minutes. This is the option we plan to use.
- 2. Alternate approach - A time-of-day operated control device that turns receptacle power off at specific programmed times and be programmed separately for each day of the week. The control device shall be configured to provide an independent schedule for each portion of the building not to exceed 5,000 square feet (465 m2) and not to exceed one full floor. The device shall be capable of being overridden for periods of up to two hours by a timer accessible to occupants. Any individual override switch shall control the controlled receptacles for a maximum area of 5,000 square feet (465 m2). Override switches for controlled receptacles are permitted to control the lighting within the same area. This option can be used if so directed by the Owner.

Interior Lighting:

- The lighting system will be designed primarily based on use of lay-in 4500 to 5400 lumen volumetric style LED luminaires with electronic, high power factor, low harmonic served at 277 volts.
- Lamp color shall be the Owner standard. It is believed to be 3500ºK with a minimum CRI of 80.
- Human centric lighting will be explored in patient care areas. This requires special luminaires and more complicated controls to mimic circadian rhythms. It does add around $3/sft to the cost of the initial building design and does not use any additional energy as compared to a conventional on/off daylight harvesting system.
- Exit lights with LED lamps and emergency egress pathway lighting are to be provided and connected to the emergency distribution system. Exit lights shall be no more than 5 watts. Exit lights shall be red letters on a white face.
- The lighting system shall meet current 2015 Washington State NREC energy code.
- Indirect LED volumetric troffers are to be used in offices and other similar areas.
- LED grid volumetric/lensed luminaires are to be used in corridors and controlled via local low-voltage wall switches interconnected with the DDC and lighting control system. Local switches provide an over-ride of the system for a short period of time. The system selected should be specified to ignore the switches during scheduled times of day to avoid undesired switching.
- Life safety exit and egress lighting to remain on 24/7 as that is the intended use of the facilities.
- Direct/indirect (volumetric) lay-in grid-mounted linear LED fixtures with lenses on the direct downlight component in offices, laboratories, and conference rooms.

- Recessed LED accent down lighting to be used where applicable.
- Multi-level daylight zone controls for laboratories, and office lighting are to be provided. System will be digital and distributed.
- Automatic daylight harvesting has been interfaced with the localized digital control system in each room.
- Building interior lighting in common areas is to be controlled by DDC via a low voltage control system with computer control, relay panels and local low voltage switching, for compliance with energy code. Controls will be located at the nurse's station to allow for night-time dimming of corridors.
- Lighting control system will be based on an nLight system with luminaire level controls. Common/central core areas will be controlled from centralized network panels that are interconnected. The system would be specified to allow at least 3 different manufacturer's to bid.
- Occupancy sensors will be used in offices, conference/work rooms, corridors and restrooms per energy code requirements.
- Excessive brightness and glare shall be controlled in all instructional areas.
- Lighting levels will follow Washington Administrative Code (WAC) and Illuminating Engineering Society of North America (IESNA) recommended levels. Follow are the general guidelines:

    a. Lighting levels in patient rooms will be 20 - 30 foot-candles.
        i. Examinations will be designed for 100 foot-candles
    b. Lighting levels in offices will be 30 - 40 foot-candles.
    c. Lighting levels at the nurse's station will be 30-50 foot-candles.
    d. Lighting levels at the pharmacy will be 70-90 foot-candles.
    e. Lighting levels in stairwells and corridors will be 10 - 20 foot-candles.
    f. Lighting levels in mechanical equipment and electrical rooms will be 40 - 50 foot-candles.
    g. Lighting levels in telecommunications rooms will be 40 - 50 foot-candles.
    h. Lighting levels in labs will be 50 - 60 foot-candles.
    i. Lighting levels in the surgical rooms will be approximately 150 foot-candles and require dedicate examination lights.
    j. Lighting levels in examination rooms will be 50 – 70 foot-candles.
    k. Lighting levels in soiled and clean utility type rooms will be 30 - 40 foot-candles.
    l. Lighting levels in food service/kitchen area will be 50 - 60 foot-candles.
    m. Lighting levels at building exterior entrances will be 2 – 5 foot-candles.
    n. Lighting levels at building exterior pathways will be 1 – 2 foot-candles.

Exterior Lighting:

- Site lighting will be tightly controlled to areas of egress, pedestrian paths and parking areas. Luminaires will be LED with dusk-to-dawn full operation. Luminaires will be dark sky compliant, with distribution types carefully controlled to avoid light trespass and light pollution.

- Exterior lighting will be automatically controlled. Lighting will generally be wall-mounted LED for building perimeter. Other area lighting around building, pedestrian pathways, and within parking area will be pole-mounted LED.
- Building egress and entrances will be connected to the standby generator per Code requirements.

Fire Alarm System:

- Multiplexed, addressable fire alarm system with mylar speakers and strobes to comply with ADA and local codes.
- Corridor and common area smoke detection will be specified as a minimum. If there are a significant number of duct smoke detectors required by the mechanical system layout, then total area coverage will be used instead.
- Raised floor areas will require detection below the floor in addition to the room space per NFPA 72 requirements. None are envisioned at this time.
- Fire separation doors will have 120 VAC electro-magnetic hold open devices which will be released by the fire alarm system.
- Building is equipped with an elevator so connections for elevator recall are needed.
- Fire/smoke dampers will be a zoned shutoff system. Position switches to confirm open for motorized dampers will not be provided.
- System will be a voice alarm system to allow paging and emergency announcements throughout the building.
- Fire alarm system will be based on the Owner fire alarm system standard. Currently this is unknown.
- 24-hour battery backup for the fire alarm system will be required in addition to generator backup.
- The contractor will provide the necessary programming of the fire alarm control panel.
- Building exterior notification devices, with amber visual signals, will be provided to identify building lockdown activation.
- 100% area detection is being considered for the Windsor site as the local AHJ has indicated that employing 100% area detection could reduce the fire water storage tank size. Cost evaluations are underway to see if there is an economic advantage of the 100% detection. The building is fully sprinkled.

Telecommunications:

- Voice services will be copper and originate from the servicing utility companies demarcation cabinet located in the Main Distribution Frame (MDF) on the basement or first floor.
- Copper and optical fiber horizontal distribution system within the building to support voice and data networks. A Telephone\Data Main Distribution Frame (MDF) entrance room shall be provided on the first level with access to the first floor pathways. Distributed communication Intermediate Distribution Frame (IDF) rooms shall be provided to minimize cable runs to 90 meters. This 90 meter length to be total length including patch cords of up to 5 meters. Connection between the MDF and IDF closets will be via underground raceway systems.
- IDF communication rooms shall be located toward the center of the building wings and not at the edges of each floor where possible. IDF communications rooms will be dedicated rooms located on the catwalk level.
- Each floor wing will be configured such that the station cables are terminated on the floor/wing that serve the corresponding Work Area Outlet (WAO) except where space does not allow for an IDF room per wing. In those locations, WAO station cables will terminate at the closest IDF or MDF. Jack and cable color and labeling will be per the Owner Standards.
- A complete telephone and data cabling system shall be provided throughout the facility. System shall be installed in accordance with TIA/EIA 568B standards, and in general will include Category 6A cable runs to all workstations and printer locations, terminated at station outlet jacks patch panels using RJ45 connections at the IDF communication rooms. The system will be designed to support 10 GB/s distribution.
- Fiber optic backbone cable will be provided between the entrance room and all distributed communication rooms. 8.3 micron SM Fiber optic cables will also be provided to server rooms and certain dedicated workstations where higher level of future bandwidth is anticipated. 6-strand MM OM3 50-micron and/or 8.3 micron SM fiber optic cabling will be designed between MDF and IDF rooms. Currently, the Owner has chosen 6-strand MM OM3 and 6-strand SM cabling. Terminations will be based on TeraSPEED SM duplex LC adapters.
- Color code for cables shall be as follows unless otherwise directed by the Owner:
    - Blue: Data and Voice
    - White: Security Cameras, Meters, Facilities
    - Violet/Purple: IP Clocks and Intercoms
    - Orange: Wireless Access
    - Black: Access Control
- Standard station outlets will include cabling for two (2) RJ-45 jacks on a common single-gang stainless steel faceplate. Faceplate colored icons shall be as follows:
    - Top Left – white
    - Top Right – Orange
    - Bottom Left – Blue

  - Bottom Right – Blank

- Labeling scheme will use MDF/IDF destination name. Examples - IDF_200 1-3; HS_406 1-3
- A complete wire-basket cable tray, ladder runway, and raceway system shall be provided for the facility. Cable tray will be routed in the mezzanine level. Underground raceways with a minimum of (1) 4" spare will be provided from the MDF to each IDF and (1) 4" spare from each IDF to the adjacent IDF to form a ring. This is a precaution for future additions or cable repair. It also affords the Owner the ability to create a self-healing network backbone.
- Cable tray and conduit shall be routed from the MDF entrance room to all distributed IDF communication rooms. Distribution cable tray shall be run from distributed communication rooms to areas with large concentrations of outlets or through main corridors as to provide easy access with minimal occupant disruption. Where possible, cabling shall be routed below raised floors and rated for the environment. Cable tray system will be based around a wire basket style tray with a maximum of 30% fill. Minimum size will be 12"W with a 4" loading depth.
- Raceways shall be provided from cable trays to all outlets. Ladder rack shall be provided in all communication rooms.
- Telephone handsets, and personal computers will be provided by the Owner.
- WiFi LAN system based on 802.11b standards will be required for interior hallways, common spaces and other select rooms that require wireless access points (WAPs) for wireless networking primarily used by the students. Offices will generally not be provided with wireless provisions. Some offices rooms may be able to utilize the wireless system based on the distribution locations for the WAPs. The wireless network will use power over Ethernet (PoE) for powering the WAPs. System to be designed around Aruba 7205 with Aruba AP-205 components.
- 2 data cables to each WAP will be provided.
- Category 6A augmented copper UTP with bonded pairs cabling will be used for horizontal cabling. Some select locations will be provided with fiber optic data ports as directed by the Owner's IT department. Wall locations may use Category 6A as dictated by the Owner's IT department.
- Horizontal and Vertical wire management will be provided at each rack/cabinet. Wire management will be 6" wide for vertical support on both sides of the rack with a common/shared vertical wire management where racks adjoin. Between each 48-port patch panel a 2RU wire management unit will be shown. Between each 24-port patch panel a 1RU wire management unit will be shown.
- A 50-pair Cat 3 phone backbone will be provided between the MDF and the IDF rooms. This cable will punch down on 110 blocks and can be used for cross-connects for older analog equipment that the Owner may want to re-use that is not IP-based at current time.
- Owner standard manufacturer is unknown.

The follow is a table of items to discuss to determine what is to be provided in the contract and what will be an FF&E item:

System ID		Description	Contractor Furnished Contractor Installed (CFCI)	Owner Furnished Contractor Installed (OFCI)	Owner Furnished Owner Installed (OFOI)
1		***Telecommunications Distribution System***			
	.01	Device conduit rough-in	x		
	.01	Open cabling supports / Cable Tray	x		
	.03	Category 6A cabling for Work Area Outlets (WAO)	x		
	.04	Category 6A cabling for wireless access points	x		
	.05	Wireless Access Points			x
	.06	Optical fiber & copper back bone cabling	x		
	.07	IT equipment racks & ladder rack	x		
	.08	Fiber & conduit to High MDF demarc	x		
	.09	UPS in Telecommunications Room		x	
	.10	PDU's in Telecommunications Room		x	
	.11	Power receptacles for telecommunications rooms	x		
	.12	HVAC cooling equipment for telecommunications rooms	x		
	.13	IT grounding & Bonding infrastructure	x		
	.14	Firestopping for IT pathways	x		
2		***IP Centralized Clock System***			
	.01	Device conduit rough-in	x		
	.02	IP clock combo device & patch cord (device end only)	x		
	.03	IP clock specialty back box	x		
	.04	IP digital clocks	x		
	.05	Analog speakers, zone controllers and paping amplifiers	x		
	.06	Analog speaker specialty back box	x		

	.07	Analog speaker cabling & connectivity	x		
	.08	software licenses			x
	.09	software, servers and programming			x
3		***Audio Visual System***			
	.01	Device conduit rough-in	x		
	.02	Interactive ultra short throw LCD video projector		x	
	.03	Video projector mount and mast	x		
	.04	VGA (video)/audio input device and cabling	x		
	.05	HDMI device and cabling	x		
	.06	Audio Video network switcher	x		
	.07	Sound enhancement speaker system (per room)	x		
	.08	Audio Video network software	x		
	.09	USB switcher, extender and input device	x		
	.10	Wireless microphone, base charger and IR sensor	x		
4		***Telephone System***			
	.01	Telephone Devices (handsets)			x
	.02	Telephone servers, programming, and licensing			x
5		***Network System***			
	.01	PC workstations and monitors			x
	.02	Network electronics			x
	.03	Category 6 patch cords for telecommunications room & workstations			x
	.04	Network programming and QOS scheduling			x
	.05	Network servers, programming and			x

		licensing			
	.06	Ethernet switches (PoE and non-PoE)			x
6		***Security - Access Control System***			
	.01	Device conduit rough-in	x		
	.02	Electrical connections	x		
	.03	Low voltage cabling, security devices and terminations	x		
	.04	Access control equipment & programming	x		
7		***Security - IP Surveillance System***			
	.01	Device conduit rough-in	x		
	.02	IP surveillance cameras & patch cords (device end only)	x		
	.03	Software, cameras and licenses	x		
	.04	Physical servers and storage - NVR	x		
	.05	VMS programming			x
7		***Nurse Call System***			
	.01	Device conduit rough-in	x		
	.02	Devices	x		
	.03	Headend equipment	x		
	.04	Cabling, devices and terminations	x		
	.05	Programming and testing	x		
8		***Distributed Antenna System (Required?)***			
	.01	Device conduit rough-in	?		
	.02	Headend equipment	?		
	.03	Cabling, devices and terminations	?		
	.04	Programming and testing	?		
10		***Audio Visual Distribution Systems***			

	.01	Recessed AV wallbox and device conduit rough-in	x		
	.02	LCD flat panel display			x
	.03	Universal wall mount		x	
	.04	Network media player, licenses and software			x
	.05	Programming			x

CATV System:

- A coax style CATV system will not be provided as IPTV has replaced most TV distribution systems. IPTV systems generally run over the data network. Devices will be located in each patient area and in waiting rooms.

CCTV System:

- A limited security CCTV system will be required. This system will be remotely monitored and will include network video recorders (NVR). The NVRs will be located in the telecommunications rooms and configured for connectivity to the Ethernet network. Monitoring of the system will be via a Windows-based software package installed on a dedicated computer for the Security Resource Officer (SRO) usage.
- The security CCTV system will be continuously monitored. Software triggers can be implemented to reduce the recording data amount.
- Cameras for the security CCTV system may require TCP/IP addressing capability.
- A security surveillance type system with cameras and monitors is to be included for corridors and entry doors and elevator.
- Active components will be furnished by the Owner. This includes cameras and head-end equipment such as network video recorders and storage. Cabling will be part of the building infrastructure contract.
- Anticipated camera locations are the main entrances, waiting areas, and potentially parking lots.

Audio/Video:

- Mediated training rooms shall be equipped with presentation systems consisting of a video/graphics projection system and multimedia sources, including document camera, VCR's, DVD/CD players and connections for personal computers or laptops. All mediated rooms shall be provided with program audio systems and larger meeting/community rooms shall also be provided with voice reinforcement systems.

- Mediated rooms shall be provided with control systems based on the Owner standards. Multimedia sources shall be located in the Instructor's podium and/or media.
- Video projectors will be based primarily around an Ultra-Short Throw projection system without interactive capability. These will be wall mounted above the front teaching whiteboard. Dalite style projection boards will be used over standard whiteboards for better visibility and contrast.
- There will be either flat panel display or ultra-short throw projectors with screens in the commons for daily events display. Cost comparisons between the two options are in progress.
- Assistive listening systems shall be provided in all rooms with 40 seats or more, if such space is applicable. Headsets are checked out to individual users by the Instructor.

Intercommunication/Public Address System:

- The building interior and exterior will be provided with a public address system consisting of speakers and interconnections to sound re-enforcement system using a priority override. Paging capability will be combined with the room clock/speakers system, locker rooms, commons, corridors and similar general usage spaces.
- Paging will be provided for a minimum of 10 zones with expandability to a minimum of 16 zones.
- System will be based on Owner Standards. This is believed to be a Rauland Telecenter.
- The Owner furnished VoIP telephone system will be interfaced to this system to allow for room-to-room communication or general announcement broadcasting.

Clock System:

- Individual room and the nurse’s station clocks with synchronization using SNTP will be specified. Size is expected to be based on standard 12” digital-style clocks.
- Surgical rooms will have standard time of day clocks and additional procedure clocks.
- Commons area will be provided with 12” or larger analog-style clocks.
- The clock system will use SNTP for synchronization and will be Ethernet-based. The clocks will connect to the Rauland Telecenter system using network/Ethernet style cabling.

Access Control:

- The building requires an exterior access control system for selected doors. Access control will be via proximity cards. The system will be based on Owner standards.
- Keypads will be located at select main entry points for arming/disarming the system.

- The building will be configured for multiple zones to allow kitchen staff to enter and leave without disruption of the overall building protection. Zone discussions will be required between the Engineer and the Owner so these can properly be indicated on the construction documents.
- 24-hour battery backup in addition to generator power will be required for the access control system. This system will be feed from the NEC 702 optionally standby system.
- Perimeter doors are to be provided with door switches and proximity card reader access control.
- Intrusion detection will also be provided in the corridors and select perimeter rooms classified as "High Risk" areas such as computer labs, science rooms, etc.
- The Owner is currently working with their vendor of choice on a system design. Once selected, the vendor and the engineer will work together to depict the system installation on the construction documents.

LEED Credits (if LEED Certification is desired):

- Following is a list of Leadership in Energy and Environmental Design (LEED) points that will be sought after:
    - Sustainable Site – Outdoor Lighting – Light Pollution Reduction (1 pt)
    - Energy and Atmosphere – Superior Energy Performance (1 pt)
    - Energy and Atmosphere – Green Power and Carbon Offsets (0 pt), Generally an expensive item
    - Indoor Environment Quality – Electric Light Quality (1 pt)